



Information and Communication Technologies

EPIWORK

**Developing the Framework for
an Epidemic Forecast
Infrastructure**

<http://www.epiwork.eu>

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**D 3.4 Epidemic Marketplace
Platform Report at Month 36**

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Work package participants

The following partners have taken active part in the work leading to the elaboration of this document, even if they might not have directly contributed writing parts of this document:

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We thank the members of the GLEaM research team who contributed with relevant datasets that we will use in demonstrations in subsequent phases of the project.

Change log

Version	Date	Amended by	Changes
0.1	2012-01-20	Mário J. Silva	First draft
1.0	2012-01-31	Mário J. Silva	Publication
1.1	2012-02-24	Mário J. Silva	Corrected Statistics data.

D 3.4 Epidemic Marketplace Platform Report at Month 36

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Summary

This report describes the architecture and deployment status of the Epidemic Marketplace (EM) by the end of Month 36 of the Epiwork project.

A new release 2.0 of the EM, has been online at <http://epimarketplace.net> since the end of 2011. It has a new completely revamped front-end, based on the Drupal Content Management System.

Important architectural changes have significantly changed the software organization, which now handles the front-end and external clients uniformly. These architectural changes needed a full rewrite of the web services component of the system.

The access control scheme for the resources in the EM Repository has a user interface, enabling EM users to specify sharing restrictions and visualise access permissions from the front-end.

The meta-data model of the Repository has also been revised. Some of the meta-data elements have been moved in the hierarchy and their names changed.

Significant progress has been made on the interconnection with the Computational Platform, which also triggered substantial revisions to the EM API. The GLEaMviz software can now upload simulation results to the Epidemic Marketplace for sharing by the community.

The user base and number of catalogued resources available in the repository has not, however, enlarged significantly, as initially expected. This is due to delays on the release of a stable version with better usability and lack of sufficiently interesting data, unique to the platform, that would drive the increase of the number of users of the EM.

Epidemic Marketplace Architecture and Software Implementation status

The planned new version of the Epidemic Marketplace, with a front-end based on the Drupal Content Management System [1], has now replaced the previous software version [11], which was also running from <http://www.epimarketplace.net/>.

The software architecture of version 2.0 the EM is depicted in Figure 1. The structure is now more elegant and easier to manage. The Web Services layer has been totally re-implemented (now written in Python and no longer dependent on the *Muradora* library) and the new Front-end also uses this layer as any other EM client would (no bypasses to the internal software layers).

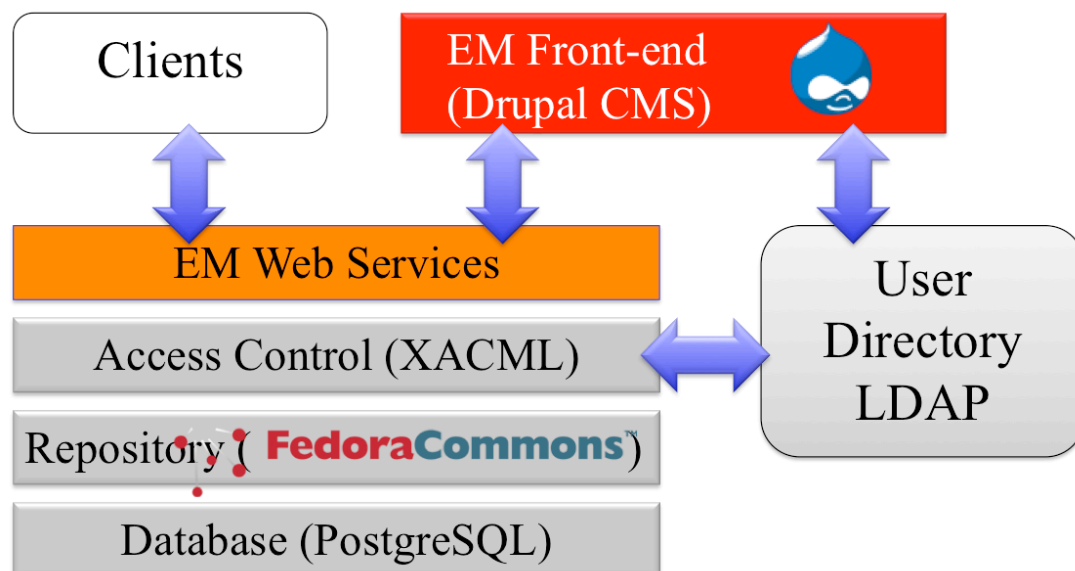


Figure 1 Software architecture of version 2.0 of the Epidemic Marketplace.

Resources and Requests creation has also been much simplified. Requests (for datasets) and Resources (datasets, events, or any digital objects in the EM Repository) are handled in similar way, both created as digital objects. When a dataset is attached to a request object, a repository curator can transform it into a resource (which simply corresponds to assigning the object to a new collection).

The forum organisation of the previous version has been deprecated. Discussions are now organised as streams of comments that can be added to resources or requests by registered users (we realized that a better forum organization would be having all the discussions in the EM centred around a specific resource, as it happens on websites like Flickr or Youtube). Internally, the comments and related information are available as an additional stream of each

resource in the repository.

Meta-data creation and visualisation has also been significantly revised. The upload and request of resources has been further simplified. Upload a new dataset to the Repository now requires less human intervention, as many of the meta-data fields are accepted to be unspecified, leaving to the user the option of filling-in the meta data. Many of the attributes are still automatically completed following the EPIWORK guidelines [7], leaving to the user only the task of confirming the meta-data elements [6][8].

We have published the application-specific software developed for the EM in a Google Code source repository [2], which is under versioning through a Subversion 1.6 server.

User Access

Access to many of the EM resources requires previous registration and is granted to authenticated users only. On October 1st 2010, we began accepting external registrations, however, permissions were restricted to either “private” (only the resource owner could visualise a resource) or “public”. Under the newly implemented scheme, resource owners may create their own groups, define membership, and specify group access permissions (see Figure 2).

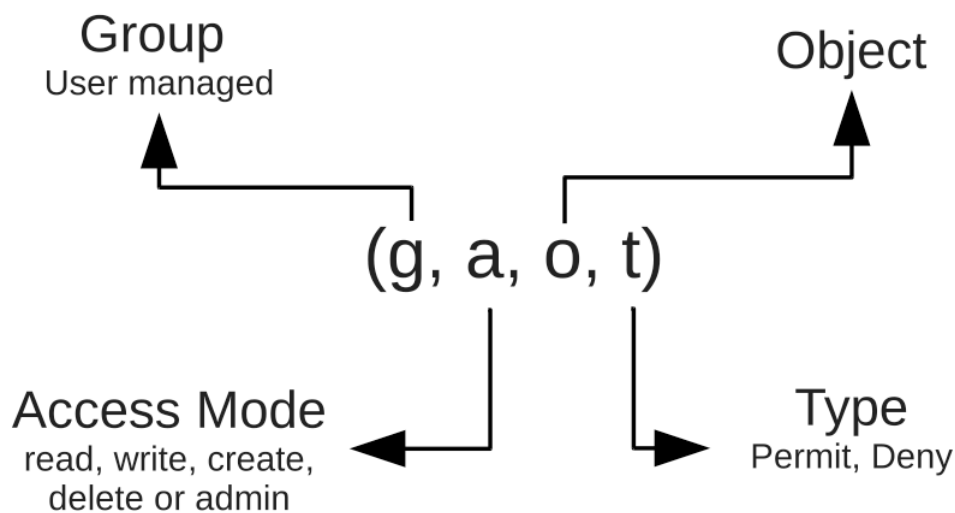


Figure 2 Access Control Model of the Epidemic Marketplace

New Epidemic Marketplace metadata model

The metadata model for epidemic resources has been updated while conducting the work on designing the ontology for modelling epidemic data (this work is mostly documented in Deliverable D3.5 [5]).

In the new revised model, each of the EM metadata elements can be refined (shown by presenting their sub-elements indented in the table below. Changes to previous EM metadata elements are pointed out in after each corresponding element¹.

<u>EM metadata element</u>	<u>Notes</u>
em:title	
em:identifier	<i>the identifier of a resource is a description of the resource, not of the contents itself; as such, it was moved to the outer level</i>
em:generalDescription	
em:abstract	
em:citation	
em:description	
em:DOI	
em:format	
em:ISBN	
em:ISSN	
em:language	
em:pubmedID	
em:subject	<i>this sub-element was an element, but it is part of the</i>

¹ Furthermore, the old <em:venue> was removed from the model, since it can be easily expressed by the <em:location> element.

EM metadata element

Notes

	<i>description, so it was moved inside</i> <em:generalDescription>
em:type	<i>only one of the type elements has been preserved (the other two, <em:typeOfDoc> and <em:typeOfWR>, were deprecated)</i>
em:URL	
em:version	
em:date	
em:dateSubmitted	
em:creator	<i>changed from <em:author>; sub-elements have also</i>
em:creatorName	<i>been renamed</i>
em:creatorOrganisation	
em:organisation	<i>Name now conforming to British English conventions;</i>
em:organisationName	<i>the sub-elements have been renamed as well</i>
em:uploader	<i>Changed from <em:publisher>; sub-elements have been</i>
em:uploaderName	<i>renamed</i>
em:uploaderOrg	
em:location	<i>This element was previously named <em:spatial>; the name was changed to a name from an adjective; sub-elements are no longer needed, since ontology terms carry all the information about the place</i>
em:time	<i>renamed from <em:temporal>; Sub-elements renamed</i>
em:from	<i>to improve expressiveness.</i>
em:to	
em:moment	<i>added to the model to give the option to associate an</i>

EM metadata element

Notes

instant to a resource.

`em:source`

the sub-elements have also been renamed

`em:sourceName`

`em:sourceURL`

`em:sourceDescription`

`em:biologicalInformation`

renamed from `<em:epidemiological>`

`em:diagnosticMethod`

`em:disease`

`em:symptom`

added from scratch to deal with cases where symptoms have not been associated with a disease

`em:drug`

`em:host`

the old `<em:hostSp>` and `<em:hostGroup>` have been collapsed into this element, because ontology terms carry all that information.

`em:pathogen`

the old `<em:pathSp>`, `<em:pathoStrain>` elements and `<em:pathoGroup>` are now described within a single element

`em:transmission`

added from scratch to support transmission modes

`em:vaccine`

`em:vector`

`em:environment`

renamed from `<em:environmental>`

`em:demography`

renamed from `<em:demographics>`

<u>EM metadata element</u>	<u>Notes</u>
<code>em:geographicalEncoding</code>	<i>renamed from</i> <code><em:geographic></code>
<code>em:socioEconomicConditions</code>	<i>renamed from</i> <code><em:socioEconomic></code>
<code>em:bibliographicCitation</code>	
<code>em:refCitation</code>	
<code>em:refDOI</code>	
<code>em:refPubmedID</code>	
<code>em:rights</code>	
<code>em:rightsHolder</code>	
<code>em:copyright</code>	
<code>em:disclaimer</code>	

Appendix A of Epiwork Deliverable D3.5 presents the metadata of a fictitious Epidemic Marketplace resource of the type Dataset illustrating the use of the above elements [5].

Integration with the Computational Platform

The integration plan of the GLEaMviz [3] epidemic simulation platform with the Epidemic Marketplace information platform is the key demonstrator of the integration between the two subsystems of the Epiwork project. The integration of these two platforms will provide GLEaMviz with increased simulation and visualization sharing capabilities and provide a means to store old simulations without increasing the storage needs in the computational platform. The integration with GLEaMviz will also provide the EM with a new source for fresh epidemic datasets, which result from simulations and also has the potential to increase its user-base with people accessing the EM repository through the GLEaMviz simulator.

The GLEaMviz simulator software (<http://www.gleamviz.org/simulator/>) is designed to let users define epidemic spreading simulation, execute them on a dedicated server, and retrieve and analyse the output data. Simulation definitions are described by an XML object/file while simulation's output data (for successfully executed simulations) are constituted by a set of

custom-format data files, one for each day of the computed simulation.

One of the main goals of the integration between the GLEaMviz simulator and the EM is to exploit the storage and sharing facilities offered by the EM repository to let users organize their simulations, share them with other users, and simplify team-working; users of the EM will thus have straightforward access to the computational capabilities of the GLEaMviz tool.

Resources in the Epidemic Marketplace are digital objects, which are identified by a unique persistent identifier, PID. Resources are composed of several datastreams. Datastreams are the units that contain the actual data and metadata associated to a resource in the repository. Datastreams have in turn an identifier, DSID, which must be unique within a resource.

Given this scenario, it was necessary to establish a proper mapping of GLEaMviz simulation definitions and simulation output data sets with EM objects:

- GLEaMviz simulation definitions will be associated to resources within the EM.
- GLEaMviz completed simulations' output data will be associated to resources within the EM that shall be composed by a list of data streams: every resource corresponding to a simulation will contain a single data stream for each daily output file. Information related to the overall simulation description will be treated as resource metadata.

This distinction between simulation definition and simulation output data is fundamental to GLEaMviz users, allowing them to flexibly share only one of the data types with other users. On the other hand, the unit of access control within the EM Repository is the resource (one cannot in the present design specify different access modes to specific streams within a resource).

Each resource is described in a metadata datastream, which has a DSID value of “EM”. The metadata is structured according to the EM Metadata application profile (<http://www.epimarketplace.net/metadata/em-dcap.html>), which is encoded with the EM-defined metadata schema (<http://www.epimarketplace.net/metadata/XML-metadata-schema.xml>). Other Datastreams consist of bytestreams of data, which are uploaded by the user. As a result, GLEaMviz Simulations uploaded to the Epidemic Marketplace will consist of an Epidemic Marketplace resource with a “EM” metadata datastream, a simulation definition datastream and several simulation output datastreams.

The interaction between GLEaMviz and the EM is depicted in Figure 3.

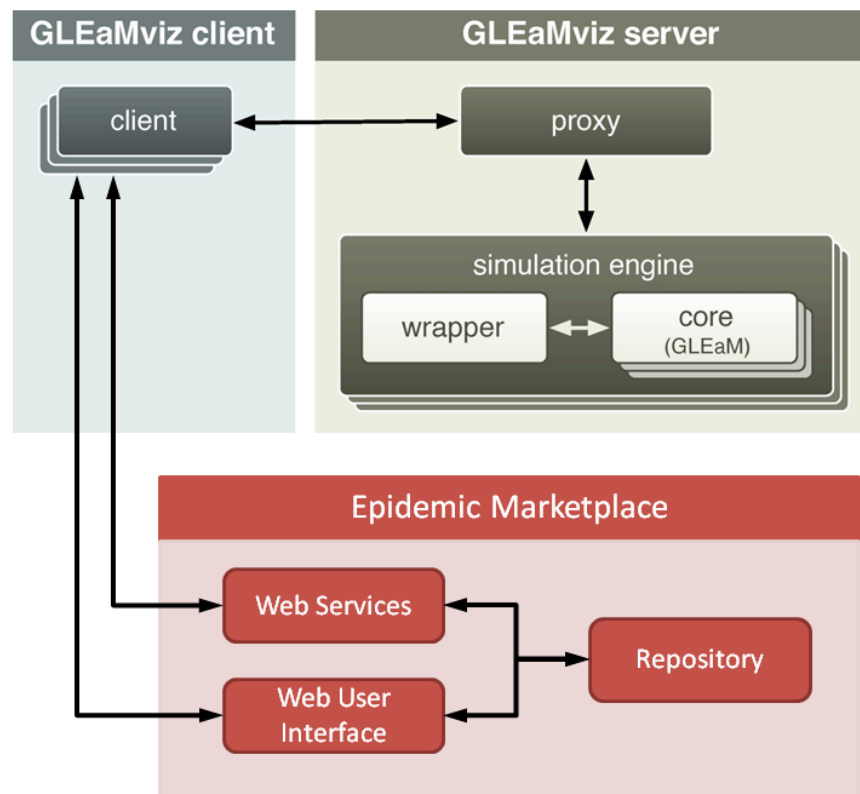


Figure 3 Architecture for the integration of GLEaMviz with the Epidemic Marketplace

We have identified the following main use-cases:

- Manage Simulation Definitions: upload, read and delete actions from the epidemic marketplace (see Figure 4).

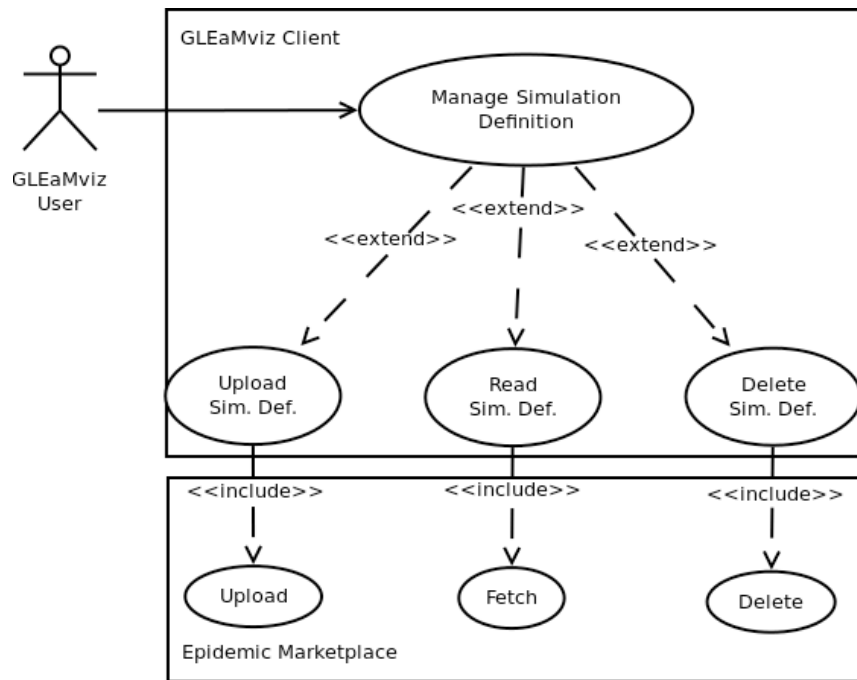


Figure 4 Manage Simulation Definitions Use-Case

- Manage Simulation Output Data from the GLEaMviz Client: the same use cases as above with the extended use case for the GLEaMviz Client enabling its user to visualize the simulation output data (see Figure 5).

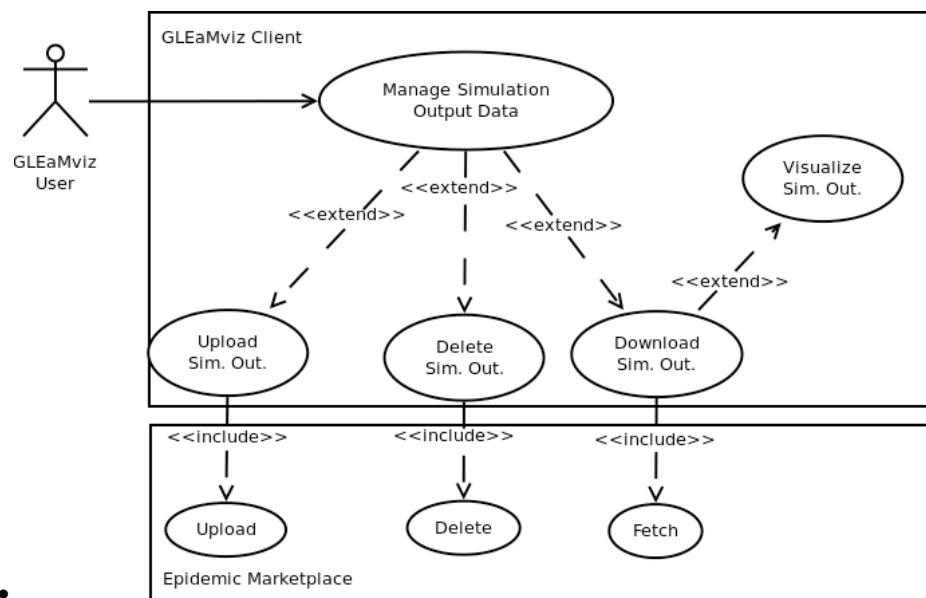


Figure 5 • Manage Simulation Output Data Use-Case

- Browse and Share: Search and TreeView, enabling the user to browse the epidemic marketplace repository, and a Select sub case which can then be extended into one

of the above mentioned Management cases or into a Share sub case, where the GLEaMviz user can manage access control to his simulations (see Figure 6).

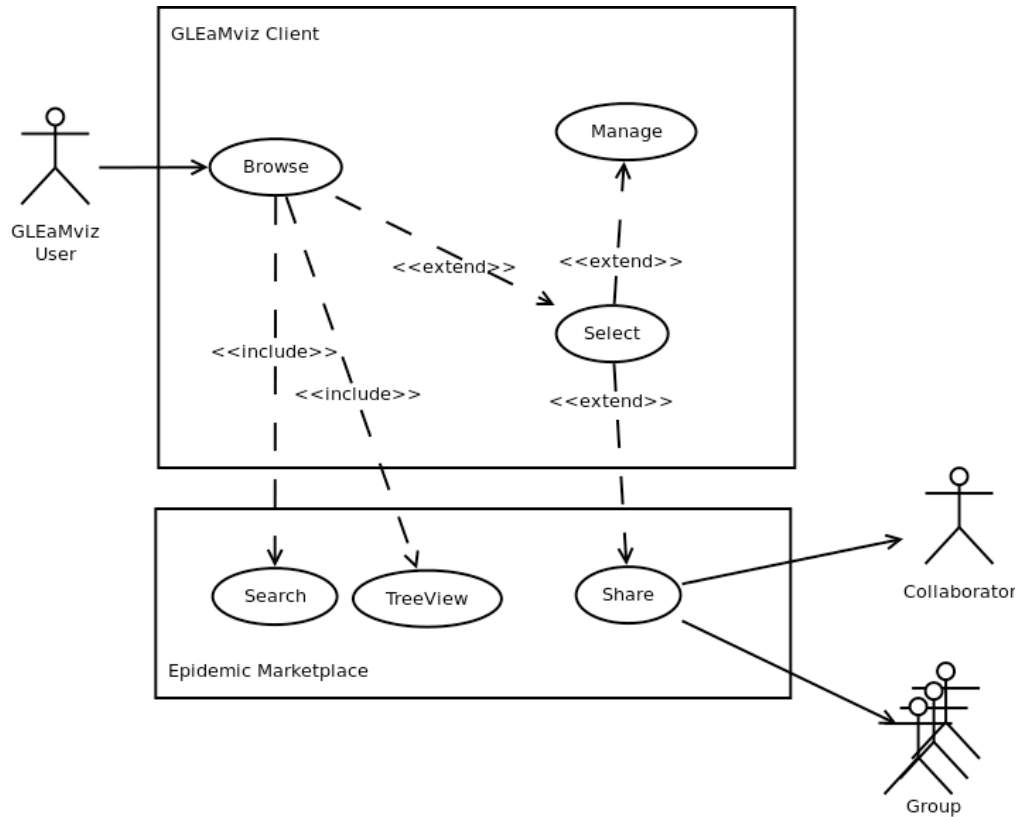


Figure 6 • Browse and Share Use-Case

The above use-cases illustrate the communication between the GLEaMviz platform and the Epidemic Marketplace. In these use cases the actions that the GLEaMviz Client and Server need to perform on the EM are search, view the resources tree, list the datastreams in a resource, fetch a datastream, delete a datastream or resource, upload a resource or datastream and share. All these actions, except for share, have been implemented as RESTful Web Services. The Share actions are presently performed via the EM web browser interface and therefore do not require a web service for communication between the GLEaMviz Client and the EM platform.

The developed EM Web Services to be used by GLEaMviz are described online in the Epidemic Marketplace website (see http://www.epimarketplace.net/developers_corner).

Distributed User Authentication

The GLEaMviz and the EM users are authenticated across a synchronized infrastructure enabling them to transparently access both platforms with the same credentials. This enables

GLEaMviz users to avoid re-registering for EM platform credentials, and vice-versa, therefore allowing seamless single sign-on access to both platforms. This synchronization should help foster user participation in both GLEaMviz and EM platforms.

Both platforms use OpenLDAP software to manage their users and a mirror configuration for synchronizing their users [12]. GLEaMviz users are organized in two organizational units within our LDAP server, one of them private, which is not shared with EM, and a set of users which are shared with EM and can access both platforms. EM users will be shared with GLEaMviz for the same purpose but without the need for a private organizational unit.

Datasets

We continued adding resources to the EM repository since it was first released internally, not only to demonstrate the repository functionality and the adopted meta-data schema, but now also to demonstrate its integration with the epidemic modelling and visualization software under development in other work-packages of the Epiwork project. In particular, the input files of the GLEaMviz simulator have been uploaded and their meta-data was characterized for inclusion in the Epidemic Marketplace.

Some of the statistics on the resources and accesses to the Epidemic Marketplace are given below:

- Number of registered users (on Jan 31, 2012): 29
- Number of distinct uploaders (on Jan 31, 2012): 11
(some users have registered multiple accounts)
- Number of pending Resource Requests (on Jan 31, 2012): 5
- Number of distinct Resources in the EM (on Jan 31, 2012): 96
(many potential datasets still in other databases in the process of uploading, such as inflenzanet.eu or the EM MedCollector [13])
- Number of distinct visits to the EM Website (during January, 2012, measured by Google Analytics): 757

User Interface Design

In the following pages, we provide some of the most relevant screenshots from the current user interface of the Epidemic Marketplace.

The Epidemic Marketplace Homepage:

The screenshot displays the Epidemic Marketplace homepage with a red header and navigation bar. The header includes the EM logo, a tagline, a search bar, and a login button. Below the header, there are navigation links for Contact and Learn More, and a row of buttons for Browse, Upload, and Request. The main content area is divided into several sections: a 'Latest Announcement' section with a link to 'searchSolr webservice changed'; a 'Not Registered Yet? Register now!' section with links to 'Become a Curator' and 'Developers Corner'; a 'Resources' section with a 'See More' link; a '554 Visitors' section with a line graph showing visitor trends from January to December; a 'Recent Requests', 'Popular Requests', and 'Recent Uploads' section; a 'Website Tour' section with a video player showing a demo of the site; and a 'Most visited documents of the week' section featuring two documents: 'Epi Info' by Luis Filipe Lopes and 'cumEI Salvador' by Daniela Paolotti. The footer includes the EPIWORK logo and the European Union flag.

EM
Epidemic Marketplace ... a platform for integrating and sharing epidemiological data.

Search for... Search

// Contact // Learn More

Browse Upload Request

Latest Announcement
searchSolr webservice changed
[See More](#)

Not Registered Yet? Register now!
[Become a Curator](#)
A curator is a user that has some administrative permissions over the Epidemic Marketplace website. [See more](#)
[Developers Corner](#)
You can access to our Web Services, Tools, Manuals and Significance. [See more](#)

Resources
[See More](#)

554 Visitors
0 125 100 75 50 25 0
Jan Feb Jul Aug Sep Oct Nov Dec
[See More](#)

[Recent Requests](#)
[Popular Requests](#)
[Recent Uploads](#)

Website Tour
03:07
vimeo


Most visited documents of the week

[Epi Info](#)
Luis Filipe Lopes
2010-09-17
Subject: Epidemiology
Type: Software
[See more](#)

[cumEI Salvador](#)
Daniela Paolotti
2010-06-10
Subject: Epidemiology
Type: Dataset
[See more](#)

[Epidemic Marketplace Demo from Zamite on Vimeo.](#)

Browser Main Screen with Tag Cloud:

**EM**
Epidemic Marketplace >> Browse

Login

Search for... Search

// Browse // Upload // Request // Contact // Learn More

Browse for EM Resources

Browse by:

Title

Uploader



Subject

Type


Date

[Most Recent Uploads](#)
[Most Recent Requests](#)
[Top Popular Requests](#)

002-test-vr another test arrival times global asdfat australia cumulative cases june
19 2009 behaviour bbla brazil imported cases fraction odc-flu-updates - 2011-02-
15 10-41:15data odc-travel-notices - 2011-02-15 10-38-53data china-timeline-travel
cumargentina cumaustralia cumbrasil cumcanada cumcolombia cumcosta_rica
cumcuba cumel_salvador cumfrance cumgermany cumguatemala cumhong_kong
cumjapan cummexico cumnetherlands cumphilippines cumsingapore
dataset dataset harvested from social networks
demography document economy environment
epidemic epidemiological data epidemiology event
generic iso-obo influweb meta-information metadata vocabulary
organisation sdgh software temitula **web resource**



Visualisation of a set of resources:

**EM**
Epidemic Marketplace >> Browse

Login

Search for... Search

// Browse // Upload // Request // Contact // Learn More

Filter by

Title

Uploader

Subject

Type

Date

Order by

Title

Uploader

Subject

Type



Date

Resources Filtered by: All matching epidemic, Ordered by: Title (A to Z)


[Demographic Data Types](#)
fedoraAdmin
2012-01-17
Subject: Meta-Information
Type: Metadata vocabulary
[See more](#)

[Epidemic Marketplace Subjects](#)
fedoraAdmin
2012-01-17
Subject: Meta-Information
Type: Metadata vocabulary
[See more](#)

[Epidemic Marketplace Types](#)
fedoraAdmin
2012-01-11
Subject: Meta-Information
Type: Metadata vocabulary
[See more](#)



Simplified upload interface:



Epidemic Marketplace >> Upload

Mário J. Silva

Search for... Search

// Browse // Upload // Request // Contact // Learn More

Upload

Please fill up this form if you need to register a new resource.
If you need to request assistance from the EM administrators, please [contact us directly](#)
Please note that the * fields are mandatory.

Title: *

Type: *

Subject: *



Upload method:

Upload file:


Choose File No file chosen

Upload

EPIWORK

Simplified Request Page:



Epidemic Marketplace >> Request Resource

Mário J. Silva

Search for... Search

// Browse // Upload // Request // Contact // Learn More

Request Resource

Please fill this form if you could not find the resource you have been looking for in the EM and would like to get assistance from the EM community.
Your request will be visible by EM users and can be commented and shared by them.
If you need to request assistance from the EM administrators, please [contact us directly](#)
Please note that the * fields are mandatory.

Title: *

Type: *

Subject: *



Describe your Request: *

Send Request


See also

[See All Requests](#)
[See Popular Requests](#)
[See Recent Requests](#)

EPIWORK

Resource “card” view of a “dataset”:

**EM**
Epidemic Marketplace >> Resource

Mário J. Silva

Search for... Search

// Browse // Upload // Request // Contact // Learn More

Resource

Available actions

Twitter Dataset H1N1 + Italy 29-5-2009

Subject:
Epidemiology

Description:
This file is a TSV saved as .txt.
It contains data from messages collected in twitter containing the words H1N1 and Italy.
Information is stored in 7 distinct columns, containing the following data:
1- Keyword 1 (disease)- H1N1
2- Keyword 2 (location)- Italy
3- Source (Twitter)
4- Author of the message (user id)
5- The message body (evidence)
6- score
7- date (day and hour)
This Dataset contains data collected between 8-5-2009 and 26-5-2009

Resource type:
Dataset


Uploaded by:
Luis Filipe Lopes on 2010-03-22

View
[View details](#)
[Download Resource](#)
[Download Metadata](#)

Leave your comment: *

Ok

Resource “card” view of an “event”:

**EM**
Epidemic Marketplace >> Resource

Mário J. Silva

Search for... Search

// Browse // Upload // Request // Contact // Learn More

Resource

Available actions

ECSS'11 - European Conference on Complex Systems

Subject:
Generic

Date:
2011-09-12 to 2011-09-16
<http://eccs2011.eu/>

Resource type:
Event

Uploaded by:
Mário J. Silva on 2011-03-07

Description:
As one of the most important annual Events in Complex Systems Science, the conference aims to provide a broad forum for the diverse communities engaged in Complex Systems research, ranging from the Life Sciences to Physics, from Computer Science to Social Science, from Mathematics to Origin of Life, and from Networks to Policy Implications

View
[View details](#)
[Download Resource](#)
[Download Metadata](#)
[Share](#)
[Edit](#)
[Delete](#)

Leave your comment: *

Ok

Resource Permissions:

EM
Epidemic Marketplace >> Define permissions for a resource

Mário J. Silva

Search for... Search

// Browse // Upload // Request // Contact // Learn More

Define permissions for a resource

Available actions

Permissions for **Public**:

☒ Read

[Submit Permissions](#)

[View](#)

[View details](#)

[Download Resource](#)



[Download Metadata](#)

[Share](#)

[Edit](#)

[Delete](#)

EPIWORK

Statistics Page:

EM
Epidemic Marketplace >> Statistics

Mário J. Silva

Search for... Search

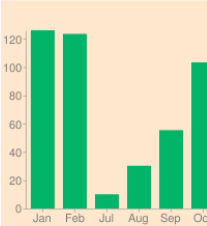
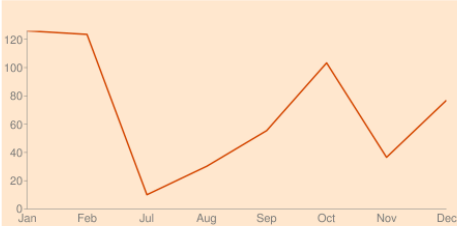
// Browse // Upload // Request // Contact // Learn More

Statistics

You can easily see how many datasets the Epidemic Marketplace hosts and how many visits it had. You can also see how many registered members the EM currently has.

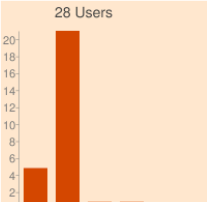

566 Visitors

The Epidemic Marketplace has 566 visits at the moment. Visits are being counted since July 2011. You can check the visits rate on the graphic below.



28 Registers

The Epidemic Marketplace currently has 28 registered members from 3 different countries. You can check on the map below all the different nationalities of the EM registered users until now.



Conclusion

This report describes the work performed in the period between the public release of the EM 1.0 and the new EM 2.0.

We have fulfilled the goal of adding a new front-end to the EM based on the Drupal Content-Management System as forecasted in Deliverable D3.3 and are now demonstrating integration of the Epidemic Marketplace with epidemic forecasting software.

The implementation of the new access control scheme that would enable sharing of datasets under a social networking paradigm, and the negotiation of access rights to the datasets through the EM is delayed, but we still plan to complete it within the next year. We plan to further disseminate the EM through increased participations in events attended by epidemic modellers and announcements in epidemiologists' forums.

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